For further discussion of the effect of interest- 
grown more slowly than average during 
the monetary aggregates has typically 
short cycles with an unusually short 
remarkable drop in M-1 velocity. This 
NOW accounts, there has been a 
no regulatory ceiling on the interest rates 
counts, introduced in January 1983, have 
the new accounts. Super-NOW ac-
velocity growth is that additions to M-1 
deposits. Even more relevant for future 
Velocity in 1983
As of April 1983, 23 percent of M-1 
consistent of interest-paying checkable 
deposits. Even more relevant for future 
velocity growth is that additions to M-1 
are likely to be more heavily weighted in the 
currences, Super NOW accounts, if 
introduced in January 1983, have no 
regulatory ceiling on the interest rates 
paid if the account meets the $2,500 
minimum-balance requirement.

Since the introduction of nationwide 
NOW accounts, there has been a 
remarkable increase in the use of M-1 
velocity. This decline in velocity has occurred over a 
business cycle with an unusually short 
and an unusually long and deep 
recession. Postwar velocity for each of 
the monetary aggregates has typically 
grown more slowly than average during 
recessions and more quickly than aver-
age during recoveries (see table 1). The most recent cycle included six quarters 
of recession and four quarters of recov-
ery. M-1 velocity growth was 6.0 per-
cent in the recession and 2.3 percent 
in the recovery—statistics similar to those 
for the old M-2 aggregate. If we adjust 
the cycle averages for the unusually long 
recession and short recovery, we mea-
sure a "trend" of M-1 velocity growth in 
the last cycle. 
A rough estimation of the Federal 
Reserve's expectations about velocity for 
1983 can be obtained from information 
provided to Congress in the Humphrey-
Hawkins report. 
The GNP forecast (8.0 percent to 9.0 percent in growth in 1983) is the "central tendency" of the forecasts 
by the Board of Governors and the indi-
vidual Federal Reserve Bank presidents. 
The GNP forecast takes into account the 
targets chosen for 1983. The midpoint of the 
M-1 target is 6.0 percent, implying a 
"central tendency" forecast for M-1 velo-
cy growth of 2.0 percent to 3.0 percent. 
The expectations for M-1 velocity are 
below the historical trend. Given the 
historical record of above-trend velocity 
growth in the first year of recovery, this 
forecast implies a downward shift in the 
M-1 velocity trend. The midpoint of the 
M-2 target is 8.5 percent, implying a "cen-
tral tendency" forecast for M-2 velocity of 
-0.5 percent to 0.5 percent. The historical 
growth rate in recoveries was 0.2 per-
cent, within this forecast range. 

5. The actual average M-1 velocity growth for the 
last cycle is a weighted average of the growth in the 
recession and the growth in the recovery: 

-0.3 + 6.0/10 = 0.6/10 (2.0)
+4/10 (2.3).

From 1984:1Q through 1985:1Q, there were 141 quarters 
with 33 quarters of recession and 108 quarters 
of recovery. Using this experience as a 
guide, we can adjust velocity growth over the 
last cycle to see what it would have been if the cycle had been more like those in the past: 

1.3 = 33/141 (2.0) + 108/141 (2.3). 

6. See "Monetary Policy Objectives for 1983," the 
report pursuant to the Full Employment and Bal-

Conclusion
The rapid growth of the aggregates in 
late 1982 and early 1983 reflects both the 
flow of funds into new accounts and a 
policy adjustment in response to a 
downward shift in the velocity trends. 
The Federal Reserve seems willing to 
accept M-1 growth above the target 
ranges in 1983 as velocity continues to 
decline. If the decline persists, the target 
might have to be raised.

If economic growth continues to 
accelerate, however, and velocity growth 
returns to historical patterns, then the 
Federal Reserve would have to lower 
M-1 growth to preserve recent success in 
reducing inflation. In this period of regu-
lation change and disinflation policy, 
the Federal Reserve might not be able to use 
M-1 targets to guide short-run, open-
market operations. However, empirical 
evidence indicates that there has been a 
lag between changes in monetary policy 
and changes in economic activity. There 
should be time to adjust the long-run 
targets in response to large unexpected 
developments in velocity before they 
induce undesired changes in economic 
activity and prices.

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Velocity of money is the ratio of nominal GNP to the money supply. The monetary targets are based on expectations for future velocity growth. If velocity growth deviates from the targets, the Federal Reserve must act. Changes in velocity can depend on an extended period, and if the Federal Reserve chooses to stay on a pre-determined disinflation course, then the monetary targets have to be changed. This Economic Commentary examines the monetary targets in light of recent changes in the velocity of money.

Velocity of money is determined by the aggregate behavior of individual peoples and firms. This behavior depends on many factors, including the length of pay periods, the uncertainty of future income and expenditure, and the opportunity costs of holding wealth in the form of money. Institutional factors also play an important role in determining velocity. The introduction of credit cards, for example, reduced the need to hold money for transactions purposes. Various cash-management techniques have greatly reduced the demand for money by firms. The development of social-welfare programs, such as unemployment compensation, social security, and health-care subsides, has reduced the need for holding precautionary balances. Other special factors that influence velocity are associated with the Federal Reserve's policy to lower inflation. As expected inflation falls, domestic investors move out of real assets previously held as inflation hedges into the form of money. The long-run trend in velocity is closely linked to expectations regarding the cost and variability of future inflation. As expected inflation falls, domestic investors move out of real assets previously held as inflation hedges into the form of money. The long-run trend in velocity is closely linked to expectations regarding the cost and variability of future inflation. As expected inflation falls, domestic investors move out of real assets previously held as inflation hedges into the form of money.

Keran argues that the fall in expected inflation explains the large decrease in M-2 velocity in 1982.

### The Velocity Assumption

Annual monetary targets are based on the Federal Reserve's assumptions that velocity is predictable within a narrow range. Velocity is said to have a deterministic trend when it has a predictable constant component that depends on nothing else but time. If velocity had a deterministic trend, it would be predictable over long time periods. Historical averages would be good indicators of future velocity growth, and the Federal Reserve could set targets for the money supply well into the future. Analysts who recommend pre-announced multi-year targets for the money supply implicitly assume a deterministic trend in which all short-term velocity fluctuations are temporary and offsetting.

Other analysts have argued that the trend assumption is unrealistic, but it is a function of many factors that can change over time. Consequently, they concluded that velocity is unpredictable and that the only way to predict velocity very far into the future is to rely on statistical models. The Federal Reserve has implied agreement with this latter view, setting monetary targets for only one year at a time. The Federal Reserve's targeting procedure can be described as an "error learning" procedure. If the Federal Reserve's model is not regularized and reaudited as unpredictable developments in velocity unfold, it will drift out of agreement with the Federal Reserve's model is not regularized and reaudited as unpredictable developments in velocity unfold, it will drift out of agreement with the Federal Reserve's model is not regularized and reaudited as unpredictable developments in velocity unfolding. The Federal Reserve's target setting process is consistent with an undeterministic velocity trend in which the short-term fluctuations include both a deterministic component and a stochastic component that changes the trend.

Monetary targeting does not require that velocity be a constant or even that it have a deterministic trend. Monetary targeting only requires that the central bank have a procedure for adjusting the targets when velocity deviates from what is expected. There are currently several methods for adjusting targets. One method is the stating of monetary targets as ranges, usually 3 percentage points wide. When the velocity prediction is more uncertain than usual, the Federal Reserve can widen the target range. A second mechanism for adjusting targets is the mid-year review in which the Open Market Committee (FOMC) can change the target range. A third mechanism is the practice of basing the annual target on the actual average level of the target range rather than the target level in the previous year's fourth quarter (year-end base drift). A fourth mechanism is the use of multiple targets. Factors that affect velocity of one of the monetary aggregates might not affect the others. The Federal Reserve has generally employed M-1 as the primary target. In periods when M-1 velocity was exceptionally uncertain, the Federal Reserve placed more emphasis on the M-2 target. An example of each of these mechanisms can be seen in the Federal Reserve's targeting experience. An unexpected decline in M-1 velocity in 1982 led the Federal Reserve to aim high in the range at the beginning of the year, to announce a desired growth rate at or above the upper limit of the range at the mid-year review, to place more emphasis on the M-2 target as of October 1982, and to accept a large overshoot in the fourth quarter as part of the base for the 1983 target.

### Historical Trends

1880-1960: The long-run trend in velocity depends on the stage of development in the market economy and on factors that determine the costs and benefits of holding money. The long decline in the old M-2 velocity shown in chart 1 is attributed to economic progress. As the U.S. economy grew, the share of savers increased and people depended less on production for home use, barter, and payment in kind. Coincident with and because of the growth of the economy, the commercial banking industry developed and the notes and bank deposits that led to "monetization" of the economy. This process accounted for much of the decline in velocity prior to World War I. The decline in velocity during World War I and World War II can be attributed to falling interest rates and to the high level of economic instability associated with the Great Depression. After World War II velocity rose and then declined; the decline in velocity probably resulted from the imposition of price controls and rationing, as well as the uncertainty created by the war. The combined effect was a build-up of money balances as the war continued.

After World War II the development of close substitutes for money, credit cards, and sophisticated cash-management techniques tended to reduce the need to hold money in the form of banks. One post-World War II period was one of relative economic stability. Business cycles fluctuated less than in previous periods, and the federal government gradually increased the coverage of social-welfare programs, further reducing the need to hold precautionary balances.

Beginning in January 1934, Regulation Q prohibited the payment of interest on demand deposits, thereby reducing the amount of interest that could be paid on savings and time deposits. The prohibition of interest payments on demand deposits and the interest-rate ceilings imposed by Regulation Q meant that a rise in interest rates would increase the opportunity cost of holding money.

In the first years of Regulation Q, interest rates were so low that the regulation probably had no effect on velocity. After World War II, however, accelerating inflation led to rising interest rates. The long-term Aaa corporate bond yield applied absolutely doubled over the 1960s and 1970s decade. As interest rates rose to new highs with each succeeding business cycle, the opportunity cost of holding money continued to rise.

1960-82: M-1 velocity continued to grow about 3 percent per year from 1960 until 1982, whereas M-2 velocity growth was approximately zero over the whole period. The divergence between velocity growth trends for M-1 and M-2 reflects binding interest-rate ceilings on deposits and innovations in the market that enabled depositors to economize on M-1 balances. The growth rate of M-1 velocity was very low in the period following the post-1974 decrease in M-1 demand was the focus of extensive research by the Federal Reserve. Although M-1 velocity was variable, it was predictable within tolerances suggested by the monetary targets. This stability appears all the more remarkable in light of the many institutional and economic factors that were changing during this period.

In passing the Depository Institutions Act of 1980, Congress removed most of the interest-rate ceilings that had been in effect since 1934. In 1981, depositary institutions nationwide were authorized to offer interest-bearing transactions accounts. The introduction of these new interest-bearing checkable accounts was expected to reduce velocity growth as the public went through the transition of moving money out of accounts, both savings and checking, into the new ac-
velocity of money is the ratio of nominal GNP to the money supply. The monetary targets are based on expectations for future velocity growth. If velocity growth deviates from the target, it could imply a need for an extended period, and if the Federal Reserve chooses to stay on a predetermined disbursement line, then the monetary targets have to be changed. This Economic Commentary examines the monetary targets in light of recent changes in the velocity of money.

Velocity of money is determined by the aggregate behavior of individual people and firms. This behavior is affected by many factors, including the length of pay periods, the uncertainty of future income and expenditure, and the opportunity costs of holding wealth in the form of money.

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Annual monetary targets are based on the assumption that velocity is predictable within a narrow range. Velocity is said to have a deterministic trend if it has a predictable component that depends on nothing else but time. If velocity had a deterministic trend, then it would be predictable over long time periods, historical averages would be good indicators of future velocity growth, and the Federal Reserve could set targets for the money supply well into the future. Analysts who recommend preannounced multi-year targets for the money supply implicitly assume a deterministic trend in which all short-term velocity fluctuations are temporary and offsetting.

Other analysts have argued that the trend of velocity is not deterministic, but that it is a function of many factors that can change over time. Consequently, they concluded that the growth rate of velocity varied and that there is no consistent wind in which all short-term velocity fluctuations are temporary and offsetting.

The Federal Reserve has implied agreement with this latter view, setting monetary targets for only one year at a time. The Federal Reserve's targeting procedure can be described as an "error learning" procedure according to which monetary targets are regularly reviewed and readjusted as unpredictable developments in velocity unexpectedly diverge from the targets. The consistency with an undeterministic velocity trend in which the short-term fluctuations include both cyclical and monetary component that changes the trend.

Monetary targeting does not require that velocity be a constant or even that it have a deterministic trend. Monetary targeting only requires that the central bank have a procedure for adjusting the targets when velocity deviates from what is expected. There are currently several methods for adjusting targets, but one method is the stating of monetary targets as ranges, usually 3 percentage points wide. When the velocity prediction is more uncertain than usual, the Federal Reserve can widen the target range. A range allows the Federal Reserve some flexibility as it gathers more information about velocity. A second mechanism for adjusting targets is the mid-year review in which the Federal Open Market Committee (FOMC) can change the range. A third mechanism is the practice of basing the annual target on the average level of the target range rather than the level target in the previous year's fourth quarter (year-end base drift). A fourth mechanism is the use of multiple targets. Factors that affect velocity of one of the monetary aggregates might not affect the others. The Federal Reserve has generally employed M-1 as the primary target. In periods when M-1 velocity was exceptionally uncertain, the Federal Reserve placed more emphasis on the M-2 target.

An example of each of these mechanisms can be seen in the Federal Reserve's targeting experience. An unexpected decline in M-1 velocity in 1982 led the Federal Reserve to aim high in the range at the beginning of the year, to announce a desired growth rate at or above the upper limit of the range at the mid-year review, to reduce the minimum level of the target range as of October 1982, and to accept a large overshoot in the fourth quarter as part of the base for the 1983 target.

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After World War II the development of close substitutes for money, credit cards, and sophisticated cash-management techniques tended to reduce the need to hold money in the form of cash. One post-World War II period was one of relative economic stability. Business cycles fluctuated less than in previous periods, and the federal government gradually increased the coverage of social-welfare programs, further reducing the need to hold money balances.

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In the first years of Regulation Q, interest rates were so low that the regulation probably had no effect on velocity. After World War II, however, accelerating inflation led to rising interest rates. The long-term Aaa corporate bond yield approximately doubled in the 1950s and 1960s. As interest rates rose to new highs with each succeeding business cycle, the opportunity cost of holding money continued to rise.

1960-82. M-1 velocity continued to grow about 3 percent per year from 1960 until 1982, whereas M-2 velocity growth was approximately zero over the whole period. This divergence is due to the development of substitutes for money.

The divergence between velocity growth trends for M-1 and M-2 reflects binding interest rate ceilings on many savings and checking accounts and innovations in the market that enabled depositors to economize on M-1 balances. The growth rate of M-1 velocity declined sharply in 1974 as a result of higher interest rates. Post-1974 decrease in M-1 demand was the focus of extensive research by the Federal Reserve. Although M-1 velocity was variable, it was predictable within tolerances suggested by the monetary target rates. This stability appears all the more remarkable in light of the many institutional and economic factors that were changing during this period.

In passing the Depository Institutions Deregulation and Monetary Control Act of 1980, Congress repealed many of the interest-rate ceilings that had been in effect since 1934. In January 1981, depositary institutions nationwide were authorized to offer interest-bearing transactions accounts. The introduction of these new interest-bearing checkable accounts was expected to reduce velocity growth as the public went through the transition of moving money out of accounts, both savings and checking, into the new ac-
velocity of money is the ratio of nominal GNP to the money supply. The monetary targets are based on expectations for future velocity growth. If velocity growth deviates from the target set for an extended period, and if the Federal Reserve chooses to stay on a predetermined disinflation course, then the monetary targets have to be changed. This Economic Commentary examines the monetary targets in light of recent changes in the velocity of money.

Velocity of money is determined by the aggregate behavior of individual people and firms. This behavior reflects many factors, including the length of pay periods, the uncertainty of future income and expenditures, and the opportunity costs of holding wealth in the form of money. Institutional factors also play an important role in determining velocity. The introduction of credit cards, for example, reduced the need to hold money for transactions purposes. Various cash-management techniques have greatly reduced the demand for money by firms. The development of social-welfare programs, such as unemployment compensation, social security, and health-care subsidies, has reduced the need to hold precautionary balances. Other special factors that influence velocity are associated with the Federal Reserve's policy to lower inflation. As expected inflation falls, domestic investors move out of real assets pre-eminently holdings of nominal balances. The growth rate of M-1 velocity probably had no effect on velocity.

The Velocity Assumption

Annual monetary targets are based on the assumption that velocity is predictable within a narrow range. Velocity is said to have a deterministic component that depends on nothing else but time. If velocity had a deterministic trend, then it would be predictable over long time periods, historical averages would be very good indicators of future velocity growth, and the Federal Reserve could set targets for the money supply well into the future. Analysts who recommend pre-announced multi-year targets for the money supply implicitly assume a deterministic trend in which all short-term velocity fluctuations are temporary and offsetting.

Other analysts have argued that the trend component of velocity is not deterministic, but that it is a function of many factors that can change over time. Consequently, they conclude that velocity is unpredictable and that it is far too varied to predict velocity very far into the future. The Federal Reserve has implied agreement with this latter view, setting monetary targets for only one year at a time. The Federal Reserve’s targeting procedure can be described as an “error learning” process in which monetary targets are placed more emphasis on the M-2 target. An example of each of these mechanisms is the current use of the Federal Reserve’s targeting experience. An unexpected decline in M-1 velocity in 1981 led the Federal Reserve to aim high in the range at the beginning of the year, to announce a desired growth rate at or above the upper limit of the range at the mid-year review, to place more emphasis on M-2 as of October 1982, and to accept a large overshoot in the fourth quarter as part of the base for the 1983 target.

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In the first years of Regulation Q, interest rates were so low that the regulation probably had no effect on velocity. After World War II, however, accelerating inflation led to rising interest rates. The long-term Aaa corporate bond yield approximately doubled over each decade. As interest rates rose to new highs with each succeeding business cycle, the opportunity cost of holding money continued to rise.

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Conclusion
The rapid growth of the aggregates in late 1982 and early 1983 reflects both the flow of funds into new areas and a policy adjustment in response to a downward shift in the velocity trends. The Federal Reserve seems willing to accept M-1 growth above the target range in 1983 as velocity continues to decline. If the decline persists, the target might have to be raised. In the Federal Reserve’s decision to raise the targets could be misconstrued as being inflationary. If economic growth continues to accelerate, however, and velocity growth reduces, the Federal Reserve would have to lower M-1 growth to preserve recent success in reducing inflation. In this period of regulatory change and disinflation policy, the Federal Reserve might not be able to use M-1 targets to guide short-run, open-market operations. However, empirical evidence indicates that there has been a lag between changes in monetary policy and changes in economic activity. There should be time to adjust the long-run targets in response to large unexpected developments in velocity before they influence underlying changes in economic activity and prices.

Economist William T. Gavin does research in the areas of monetary theory and monetary policy for the Federal Reserve Bank of Cleveland. The views stated herein are those of the author and not necessarily those of the Federal Reserve Bank of Cleveland or the Board of Governors of the Federal Reserve System. NOTE: No issues of the Economic Commentary were published in May.

Federal Reserve Bank of Cleveland Research Department P.O. Box 6387 Cleveland, OH 44101

Table 1 Cycles in Velocity Growth

<table>
<thead>
<tr>
<th>Aggregate</th>
<th>Period</th>
<th>Reces-</th>
<th>Reces-</th>
<th>Average</th>
</tr>
</thead>
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<tr>
<td>M-1</td>
<td>1948:IVQ - 1979:IVQ</td>
<td>0.3</td>
<td>3.9</td>
<td>3.2</td>
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<td>M-2</td>
<td>1948:IVQ - 1979:IVQ</td>
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<tr>
<td>Old M-2</td>
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<td>-2.7</td>
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<td>M-2</td>
<td>1940:IVQ - 1982:IVQ</td>
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Address Correction Requested: Please send corrected mailing label to the Federal Reserve Bank of Cleveland, Research Department, P.O. Box 6387, Cleveland, OH 44101.

June 6, 1983

Economic Commentary

Velocity and Monetary Targets

by William T. Gavin

To interpret the monetary targets in 1983, we have to know where we have been and where we are going. The equation of exchange, MV = PQ, provides a simple accounting framework for keeping track of where we have been and for suggesting where we may be going. M is the money supply, however defined, V is the related velocity, or turnover of money, P is the general price level, and Q is real output.

The important variables are prices and real output. However, the central bank cannot determine how much of a given change in the money supply will go into prices and how much will go into output. In the long run output will be determined by real economic factors, such as population growth, capital accumulation, technology, and the incentive structure implied by tax laws and economic regulations. Even though changes in money growth may not affect output in the long run, changes in the money supply may have substantial effects in the short run.

The uncertainty about how monetary policy affects prices and output over periods as short as one year has led economists to relate monetary targets to nominal gross national product (GNP), the product of P and Q. If the Federal Reserve constrained money growth, it would restrain nominal GNP. Initially, real output may also be restrained (as per M-1 in 1981-82). Over time, real economic factors should dominate, and real growth should return to its underlying trend. If the reduced money-supply targets were maintained over a period of years, nominal GNP would be restrained and inflation would be reduced.

At some point, however, a stable relationship between the money supply and the price level might have to be raised. If the public expects the central bank to lower money growth, there will be a lag in the reaction of the public and the Federal Reserve might not be able to use targets to guide short-run, open-market operations. However, empirical evidence indicates that there has been a lag between changes in monetary policy and changes in economic activity. There should be time to adjust the long-run targets in response to large unexpected developments in velocity before they influence underlying changes in economic activity and prices.

Federal Reserve Bank of Cleveland

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<tbody>
<tr>
<td>M 1</td>
<td>1960:IQ - 1978:IVQ</td>
<td>-0.3</td>
<td>3.9</td>
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<td>M 1</td>
<td>1960:IVQ - 1978:IVQ</td>
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5. A rough estimation of the Federal Reserve’s expectations about velocity for 1983 was provided in information provided to Congress in the Humphrey-Hawkins Act.

6. The actual average M-1 velocity growth for the last cycle was 3.1 percent to 9.0 percent growth in 1983 (4 percent to 9.0 percent in 1981-82). Over time, real economic developments in velocity before they occur may return to its underlying trend. If the reduced money-supply targets were maintained over a period of years, nominal GNP would be restrained and inflation should return to its underlying trend. If the reduced money-supply targets were maintained over a period of years, nominal GNP would be restrained and inflation should return to its underlying trend.